(rev. 8-75)

RT-R/420

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

REPORT OF CALIBRATION May 31, 1978

of Aerial Mapping Camera

Camera type	Wild Heerbrugg RC10	Camera serial no.	1384
Lens type	Wild Aviotar II	Lens serial no.	AtII 4105
Nominal focal length	304 mm	Maximum aperture	f/4
		Test aperture	f/4

Submitted by
NASA Ames Research Center
Moffett Field, California 94035

Reference: Letter dated January 20, 1978 from Mr. Thomas R. Pochari

These measurements were made on Kodak micro flat glass plates, 0.25 inch thick with spectroscopic emulsion type V-F Panchromatic, developed in D-19 at 68°F for 3 minutes with continuous agitation. These photographic plates were exposed on a multicollimator camera calibrator using a white light source rated at approximately 3500K.

I. Calibrated Focal Length: 304.956 mm

This measurement is considered accurate within 0.010 mm

II. Radial Distortion:

Field angle (degrees)	$\overline{D}_c$	D_c for azimuth angle 0° A-C	90° A-D	180° B-D	270° B-C
	µm	µm	µm	µm	µm
7.5	-3	-5	-2	-4	-1
15	0	1	1	-5	2
22.5	1	-6	7	-4	7

The radial distortion is measured for each of 4 radii of the focal plane separated by 90° in azimuth. To minimize plotting error due to distortion, a full least-squares solution is used to determine the calibrated focal length. $\overline{D}_c$ is the average distortion for a given field angle. Values of distortion D_c based on the calibrated focal length referred to the calibrated principal point (point of symmetry) are listed for azimuths 0°, 90°, 180°, and 270°. The radial distortion is given in micrometres and indicates the radial displacement of the image from its ideal position for the calibrated focal length. A positive value indicates a displacement away from the center of the field. These measurements are considered accurate within 5 µm.

III. Resolving power in cycles/mm Area-weighted average resolution 42.7

Field angle:	0°	7.5°	15°	22.5°	30°	35°	40°
Radial lines	81	57	24	24			
Tangential lines	81	81	57	48			

The resolving power is obtained by photographing a series of test bars and examining the resulting image with appropriate magnification to find the spatial frequency of the finest pattern in which the bars can be counted with reasonable confidence. The series of patterns has spatial frequencies from 2.5 to 135 cycles/mm in a geometric series having a ratio of the 4th root of 2. Radial lines are parallel to a radius from the center of the field, and tangential lines are perpendicular to a radius.

IV. Filter Parallelism

The two surfaces of the Wild 525 Pan No. 4437 filter accompanying this camera are within ten seconds of being parallel. This filter was used for the Calibration.

V. Shutter Calibration

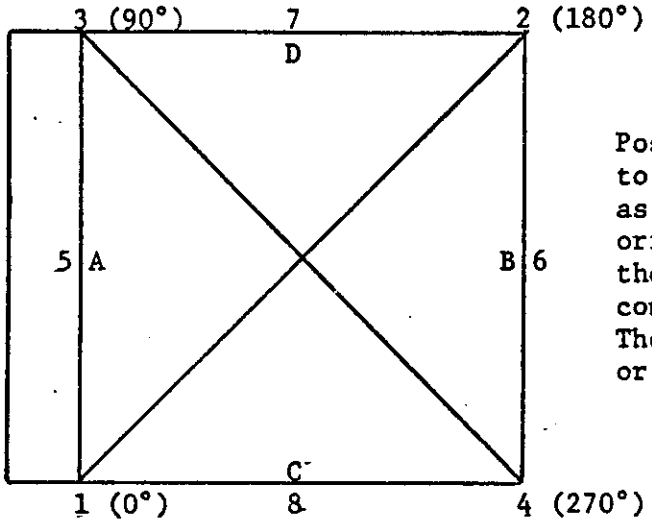
Indicated shutter speed	Effective shutter speed	Efficiency
1/200	4.2 ms = 1/240 s	74%
1/400	2.1 ms = 1/470 s	74%
1/600	1.4 ms = 1/710 s	74%
1/800	1.1 ms = 1/940 s	72%
1/1000	0.9 ms = 1/1170 s	72%

The effective shutter speeds were determined with the lens at aperture f/ 4 The method is considered accurate within 3%. The technique used is Method I described in American National Standard PH3.48-1972.

VI. Magazine Platen

The platen mounted in Wild RC10 film magazine No. 1384-64 does not depart from a true plane by more than 13 μm (0.0005 in).

VII. Principal Point and Fiducial Coordinates



Positions of all points are referenced to the principal point of autocollimation as origin. The diagram indicates the orientation of the reference points when the camera is viewed from the back, or a contact positive with the emulsion up. The direction-of-flight fiducial marker or data strip is to the left.

	X coordinate	Y coordinate
Indicated principal point, corner fiducials	-0.015 mm	-0.005 mm
Indicated principal point, midside fiducials	-0.016	-0.002
Principal point of autocollimation	0.0	0.0
Calibrated principal point (point of symmetry)	0.022	-0.002

Fiducial Marks		
1	-106.017 mm	-106.003 mm
2	105.986	105.992
3	-106.010	105.992
4	105.982	-106.003
5	-110.017	-0.006
6	109.981	0.003
7	-0.014	110.004
8	-0.017	-110.007

VIII. Distances Between Fiducial Marks

Corner fiducials (diagonals)

1-2 299.812 mm 3-4 299.803 mm

Lines joining these markers intersect at an angle of 90° 00" 02"

Midside fiducials

5-6 219.998 mm 7-8 220.010 mm

Lines joining these markers intersect at an angle of 89° 59' 49"

Corner fiducials (perimeter)

1-3 211.994 mm 2-3 211.996 mm

1-4 211.998 mm 2-4 211.995 mm

The method of measuring these distances is considered accurate within 0.005 mm.

The report supersedes the previous calibration of this camera contained in USGS Report of Calibration No. RT-R/64, dated April 18, 1974

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